DOCUMENT RESUME

ED 088 828 SP 007 799

AUTHOR Hynes, Michael C.; And Others
TITLE Competency-Based Instruction--Is It Worth It?
PUB DATE Apr 74
NOTE 22p.; Paper presented at the Annual Meeting of the American Educational Research Association (Chicago, Illinois, April 1974)

EDRS PRICE MF-$0.75 HC-$1.50
DESCRIPTORS Educational Innovation; Educational Problems; *Elementary School Mathematics; Evaluation Techniques; *Performance Based Teacher Education; *Performance Criteria; Program Evaluation; Time Factors (Learning)

ABSTRACT

This document questions whether competency-based instruction is worth the effort of fighting university policies regarding the quarter or semester structure of courses or the possibility of creating anxious or frustrated college students as a result of instituting unfamiliar procedures. Do we even have a usable list of competencies? To facilitate discussion of these questions, one quasi-competency-based program in elementary mathematics education is described with the intention of giving an operational base for discussion of factors such as: a) the establishment of competencies; b) the nature of the learning environment; c) the modes of instruction; d) the role of time in instruction; and e) the evaluation of the attainment of competencies. The Elementary Program at Florida Technological University is described. Appendixes include sources of competency lists, learning environment, instructional materials, time limitation alternatives, and a bibliography. (JA)

ED 088828

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Competency-Based Instruction--Is It Worth It?

Michael C. Hynes, Douglas K. Brumbaugh, Mary Ellen Hynes

Introduction

The purpose of this paper is to generate discussion about the value of competency-based instruction in teacher education. Is it worth the effort of college professors to plan, develop, and make a competency-based program operational? Is it worth the agony of fighting university policies regarding the quarter or semester structure of courses? Is it worth the possibility of creating anxious or frustrated college students by instituting unfamiliar evaluation procedures? Do we have the list of competencies which best describes the desirable teaching behaviors of elementary or secondary teachers?

In order that questions such as these may be discussed in relation to future research efforts, one quasi-competency-based program in elementary mathematics education will be described in this paper. The description is not intended to indicate a model for any other program or university. However, the description will give an operational basis for discussion of factors in competency-based instructional programs such as: the establishment of competencies, the nature of the learning environment, the modes of instruction, the role of time in instruction, and the evaluation of the attainment of competencies.

A General Description of the Elementary Program at Florida Technological University

Elementary Education Majors at Florida Technological University have several unique features in their program. Included among these features is early and continued exposure to and experience with public school pupils. This includes tutoring, serving as a teacher aide, and student teaching. The obvious advantage of this feature is that the theory of the college class may be experienced in the schools. The elementary education major has continual supervision by a college professor who works directly with them in the public schools and in the college classroom.

SP007 799

Another important feature is the recommended course sequence. The sequence is designed for the needs of a public school teacher - the emphasis is a broad base of elementary content courses and foundational education courses. The FTU program in education is divided into three phases. Phase I, which is taken late in the student's sophomore year, or early in the junior year, is the student's first contact with education courses. The phase consists of two courses:

1. Human Development (3 qh) - in which the growth of a child is traced from birth through adolescence.

2. Teaching Analysis (5 qh) - consisting of five basic areas of coverage - writing objectives, planning units and lessons, questioning techniques, analysis of verbal and non-verbal interaction in the classroom, and socioeconomic variables. Each student is videotaped at least once during the quarter as he is teaching a lesson.

   As part of this phase, each student visits a public school at least fifteen (15) hours during this quarter to tutor. The experience is usually in a school which has students from low socioeconomic backgrounds.

Phase II, junior year student teaching, is taken for two quarters at some time in the junior year. In these quarters the student spends one-half day, four days a week, in the public school as a teacher aide. In this situation, the student is an assistant, his major responsibility being to carry out tasks prescribed by a professional. The student is visited at least once a week by a college teacher, the Block Coordinator; the student is also observed periodically by the content specialist from the University. For the other half day, the Phase II student teacher is enrolled in one of the following sets of classes:

Block A	Block B
Learning Theory	Teaching Social Science in the Elem. Sch.
Principles of Evaluation	Mathematics Programs in the Elem. School
Teaching Mathematics in the Elem. Sch.	Reading in the Elementary School
Basic Foundations of Reading	Teaching Science in the Elem. School

(Block A courses are prerequisites for Block B courses.) Alternate methods of scheduling the public school experiences such as two full days in the public schools and two full days at the University have been tried on a trial basis.

Phase III consists of a quarter of full-time teaching except for the first week in which the students meet on campus all day each day to discuss the planning of their lessons, construction of audio-visual aids, investigation of available equipment, etc. It should be noted that these time requirements are flexible; for example, the student might spend one full day at FTU and the next day in the school. They are also enrolled in a class which meets one evening a week, which is designed to serve as a discussion period for their problems in the school, school law, liability, professionalism, etc.

Students are evaluated in many ways in their student teaching experiences. The evaluation input comes from the public school directing teacher, the assigned University coordinator for the public school, and the content specialist. An attempt is made to videotape each student at least once during the senior year teaching experience.

Mathematics and Mathematics Education Requirements

The elementary education major at FTU is currently required to take two three-quarter-hour mathematics courses designed for elementary majors (a third course is recommended), and two three-quarter-hour mathematics education courses. Students transferring to FTU with an Associate of Arts degree from an accredited junior college are not required to take the mathematics courses but are encouraged to take one of the courses. A student with an aptitude in mathematics and an interest in teaching mathematics in a departmentalized situation is encouraged to pursue a specialization in mathematics. This specialization requires eighteen quarter hours of mathematics.

Once the mathematics and other prerequisite courses for Phase II have been completed, elementary majors enroll in the first of two mathematics methods courses, EDEL 301.

In this course, consideration is given to both cognitive and affective areas for competency development. At the beginning of this Block A course, the students are tested for their knowledge of the following content areas: sets numeration, whole numbers, fractional numbers, decimals and percent, integers, measurement, geometry, probability and statistics, and problem solving.

The McGraw Hill California Testing Bureau Service (CTBS) Purple Test is used. This test is designated as being appropriate for students in grades 6 and 7. It is a competency-based test with each item keyed to specific objectives and some cross-referencing procedures are employed. A student must pass each subtest of the test at the 80% level.

The test is given at the beginning of the first quarter but it is possible that a student may not pass all subtests of the test until the end of the second quarter of the mathematics course sequence. Review sessions for content areas are listed as a part of the first quarter syllabus with attendance being voluntary. The student is permitted to retake subtests by arrangement with the instructor, retaking different forms of the subtest as many times as necessary to reach the minimally acceptable level. Retake sessions are to be preceded by individual study periods for the test segment involved although no formal procedure is used to ascertain if the review has actually been done by the student. If, for some reason, a student has not passed one or more parts of the content test, and if that student has earned a grade of "C" or higher for the course, he is assigned an I grade for incomplete. He has until the end of the next quarter to complete the parts. If the test is not completed by the end of the next quarter, the course must be retaken.

Topics of Discussion

Competencies

Throughout the two quarters a revised and amended list of cognitive objectives originally established by Morford (1970) is used as a basis for the competencies deemed necessary as a minimal level of acceptance. A considerable part of these competencies can be classified as being in one of six general categories: mathematics content, objectives for an elementary mathematics program, sequencing mathematical topics, individualization of instruction, pedagogical techniques, and the use of instructional materials. Each of Morford's categories contains an objective for each of the levels of Bloom's (1956) cognitive levels. Other competencies such as: writing an evaluation letter to parents, teaching reading in mathematics, teaching the metric system, diagnosing student errors, and using commercial manipulative materials have been added to a revised list of Morford's competencies.

See Appendix A for other sources of competencies for teacher education.

Learning Environment

As noted previously, the Block A and B students spend considerable time in elementary schools, approximately twelve hours per week. The Block A program stresses observation and services normally performed by aids, correction of papers, making and running dittos, construction of bulletin boards, working with individuals or small groups, implementation of the teacher's plans, etc. Usually the three grade level assignments, lower, middle, and higher, are three weeks long. This placement scheme, although not always hierarchial or sequential, does permit the student teacher to observe a variety of age and skill levels, and helps that prospective teacher determine personal preferences in grade placement.

The exposure of the elementary major to a variety of grade levels is accomplished through a teaching center concept in which several students go to the same public school (within the FTU service area) and rotate among selected teachers within that school under the direction of the college coordinator and principal. No teacher is required to accept a student teacher but participation certificates which can be used as tuition waivers for courses at any Florida state-supported college are awarded for those that do participate.

The teaching center concept is also employed in Block B but the student teacher is assigned to two classrooms rather than three. The classroom emphasis is shifted from one of observation and peripheral participation to a role as a teacher of select aspects for short periods of time. The Block B student is required to teach a unit at least four days in length in each of the following areas: mathematics, reading, science, and social studies. The student is to teach only one unit at a time to allow for adequate development, attention to pedagogy, and delivery preparation.

The student in the elementary education program not only has responsibilities in the teaching centers but also in his university classes. These classes, in both Blocks A and B of Phase II, are held in three-hour segments. For example, the mathematics education classes meet once a week for a three-hour block of time. This arrangement allows for flexibility in planning so that lecture, demonstration and laboratory work may be used most effectively for the attainment of competencies.

See Appendix B for descriptions of other learning environments.

Modes of Instruction

A major aspect of the competency achievement in the FTU program relates to Morford's list of objectives and subclassifications as discussed in the competencies section of this paper. By engaging in activities designed for the program, students display their attainment of competencies. In the written mode, a set of more than fifty activities have been developed. (Hynes,M.C., Brumbaugh,D.K., and Kysilka,M.L. 1973)

In these activities the competency is explained in general, an example or application given, and specific instructions stated. The student is to complete the activity, write the results and submit the written description for evaluation. Although it would be possible to demonstrate teaching skills for each mathematics content area, competency must be demonstrated in at least one content area for each objective. The assumption is made that the student should be able to transfer the processes to other content areas. An attempt is made to use many content areas in the examples thus facilitating and encouraging transfer.

The student may elect to achieve some or all competencies in a way that avoids the use of the collection of activities in the written mode. This is possible by presenting a proposal to the instructor which describes a project of particular interest to that student, demonstration of teaching aids in class, completing specific class assignments, and performing well on tests of a more "Standard" nature.

A student proposal could consist of the completion of modules prepared through a grant from USOE to the Florida Department of Education under Part B, Sub-part 2 of the Education Professions Development Act (B2 Modules). These modules are similar to learning activity packages and cover a wide variety of objectives, with a more general emphasis. A student-initiated proposal must be approved prior to development if a student is to receive credit for it.

Audio tapes have been developed to guide Elementary Education students in the use of commercially-prepared materials such as task cards and laboratory kits. The tapes are designed to stimulate questions pertaining to the best use of the described materials. Other tapes provide techniques for the construction and use of teaching aids. The student is to design a module or an aid which would be used in presenting a particular concept.

Commercial products such as skill kits, audio tapes, and programmed materials are also used as instructional devices to strengthen a student who has failed a part of the content test. That student would be instructed to proceed through the materials much as an elementary child would. This provides opportunity to familiarize the student with available materials while strengthening content weaknesses.

The students in Block A are encouraged to participate in many activities in the school. Suggestions for these activities are given to each student in the form of a task sheet. These may include observing at least ten mathematics lessons, observing mathematics lessons on three successive days, and instructing or enriching a child's mathematics experience by using a manipulative aid. These and additional activities are presented on a task sheet to be initialed by the supervising teacher and college coordinator when the particular activities are successfully accomplished by the student.

For Block B experiences in the teaching center, the students accept more responsibility for the teaching act with respect to a specified segment of content. For example, in mathematics, the prospective teachers are assigned the task of developing a four-day unit of instruction about a topic chosen by the supervising teacher. However, this is not necessarily the only assignment conducted in the teaching center. The college coordinator, university instructor, or supervising teacher may request that a student perform other tasks to demonstrate selected competencies.

Both Block A and B students are periodically visited by the Mathematics Methods instructors. The visits are often used as a means for the instructor to demonstrate a particular teaching skill to student teachers.

See Appendix C for sources of other modes of instruction.

Time Limitations

Carol (1971) proposed a model of learning for mastery in which one variable is time. He considers the students as being normally distributed with respect to aptitude and states that end results will also be distributed normally by virtue of the original distribution. Carroll assumes that aptitude determines the rate of learning, and suggests that students must be allowed enough time to learn.

This time factor must be considered in the development and implementation of competency-based programs. If each student is to be allowed sufficient time to attain competencies as suggested by Carroll, then traditional pattern of quarter or semester hour courses in the universities must be altered. The use of the quarter system at FTU presents some difficulties for a competency-based program. As mentioned earlier, a student can get an "I" for the first methods course if he cannot demonstrate acceptable content competencies. However, that "I", by University policy, must be removed by the end of the next quarter. Thus, the time factor be temporarily adjusted. The time limit still exists; it is just twenty weeks long rather than ten.

See Appendix D for sources of other time limit alternatives.

Means of Evaluating Competencies

The evaluation of mathematics content competencies is a relatively simple task since it is purely an indication of whether or not the student can do different types of problems correctly on a written test. Occasionally, a more subjective evaluation might be necessary if a student repeatedly has difficulties with one or more content areas due to an anxiety about tests.

One of the difficult areas of evaluation in performance-based programs is that of poorly conceived and poorly produced student work. Some minimal level of acceptance for each competency must be established which attempts to insure that these competencies reflect more than just repetition of an instructor's words. To overcome this problem, students must be provided with many alternative sources of information so that they may begin to effectively analyze what is best for their student needs. At FTU the materials developed by Hynes, Brumbaugh and Kysilka (1973) provide alternative sources of information and activities which allow the students to demonstrate in written form that they are able to operate on the higher levels of cognition as described by Bloom as well as the lower levels.

Another difficulty of assessing competencies through written work is that the evaluation is influenced by the student's ability to express his thoughts in writing. Although writing skill is an important competency for teachers, this skill cannot be allowed to be a substitute for other skills necessary for teaching children.

The use of written skills as the only means of assessing competencies is another problem. It is certainly a faulty assumption, and perhaps the same faulty assumption of traditional programs, that the ability to do written work guarantees an ability to teach. To avoid this pitfall, the students must be observed in the classroom during the performance of competencies for teaching.

Observation in the FTU program takes many forms. The Block A activities provide an evaluation device which is independent of writing skills in the form of a task sheet. In this situation, the student is evaluated on the basis of whether or not a particular activity has been completed. Most of the tasks can be done without advance preparation or organization and they reflect a general exposure to schools, school children, teachers, roles, etc. The supervising teacher from the teaching center certifies that these tasks have been completed.

In Block B, both the college instructor and the supervising teacher in the school supervise the task of teaching units. The supervising teacher initiates the unit by suggesting a suitable content area and guides the prospective teacher in the organization of the content. Also, of course, the supervising teacher observes and evaluates each day's lesson as the unit is taught. The college instructor not only approves the written plan, but also visits each prospective teacher at least once while the unit is being taught.

In both blocks, the college coordinator makes at least weekly visits to each prospective teacher in each school. These visits may involve discussions with all the interns, or observations of individuals performing specific tasks. It is the responsibility of the college coordinator with the assistance of the supervising teacher and college instructor to write a final evaluation of the work done in the school.

Students have the option of proposing to the college instructor activities which may not have been offered by the instructor as avenues for competency demonstration. These student proposals may or may not be evaluated in writing. If a teaching aid is produced, it could be presented to the whole class and the oral presentation evaluated. Conceivably a student proposal could be evaluated by an oral exam, discussion of the topic, examination of some end product, audiotape of a lesson, or a videotape of a lesson.

The affective domain is not excluded from evaluation. The course syllabus states that 20% of the grade will be determined by the student's abilities to meet professional qualities as described by the FTU placement materials (cooperativeness, originality, resourcefulness, willingness to work, etc.). These desirable traits are continually assessed by the supervising teacher, college coordinator, and college instructor.

See Appendix E for other means of evaluating competencies.

Summary of FTU's Program

FTU's elementary education mathematics program is not totally competency based. However, a part of the emphasis is on student attainment of minimal levels of specifically stated objectives. The student is pretested for content knowledge, and competency in these content areas which normally appear in the elementary school program, must be shown before successful completion of the program. Throughout the course the student demonstrates (through tests, assignments, classroom demonstrations, and independent activities) that he is attaining additional skills and abilities.

Related to the University course work is public school participation which, depending upon the stage of development, requires the student to progress from being an observer to teaching a four-day (minimal) mathematics unit. This progress takes no more than two quarters throughout which the student is visited and observed by the methods instructor and the college coordinator. This visitation by the instructor of the mathematics methods course facilitates a blending of theory and practice in that the situations encountered in the schools can be discussed in the college class. The discussion typically uses a content area as a common ground for a discussion of specific instructional situations.

As this quasi-competency-based program has developed and continues to evolve at FTU, the following questions are frequently discussed in faculty meetings. Are

we any more certain that a student who is educated to become a teacher in a competency-based program will become a better teacher than a student in a traditional program?

Are we any more certain that a competency-instructed student will continue to reflect previously demonstrated competencies as the teaching years progress? Is the growth of the competency-based teacher faster, better, more thorough, and personally more appealing than that of a "standard" test type of course? Hopefully, this experimental session will extend the discussion of these questions, and provide impetus for research which will begin to answer these questions and many others.

Appendices

Please note: The listings in the following appendices are not intended to be exhaustive but rather representative of other sources of materials and information. Furthermore, most of the listings are related to mathematics education since both authors are involved in this area. If you have other information, please feel free to share it with the authors and others in the discussion groups.

Appendix A

Sources of Competency Lists

Appendix B

Learning Environment

Appendix C

Instructional Materials

Appendix D

Time Limitation Alternatives

Appendix E

Bibliography

Appendix A
Sources of Competency Lists

Bernard, Donald H., Teacher Assessment and Training Techniques for Teachers of Mathematics for Children Ages 10-14, (The Middle School Mathematics Project), Department of Education, Tallahassee, Florida, DOE Contract #730-072, Report #3.

The Middle School Project is designed "...to relate teacher competency to pupil learning, as well as to performance-based certification procedures." The goal is to provide an alternate means of teacher certification or re-certification. The six major competency groups listed are:

1) Knowledge of mathematics content
2) Diagnosis and evaluation in mathematics
3) Planning and instruction in mathematics
4) Using mathematics resources, equipment, games and activities
5) Communication and teaching strategies
6) Teacher motivation and assessment

The catalog includes competency statements and related teacher training materials; a listing of competencies sorted according to teacher behavior; a listing of competencies sorted according to topic; process recommended for operationalizing competencies; cataloged competencies placed in tentative, prerequisite type hierarchies; and uses of the catalog in selecting competencies for a middle school program.

Crews Molly, "A Survey of Competencies in Mathematics for the Teacher of Mathematics in the Secondary School, unpublished Masters research paper, F.T.U., Orlando, Florida 32816. A close-form survey was responded to by mathematics educators and classroom teachers from around the county. The competencies were to be rated as to general value. The concensus of those responding was that all were important but they were general. A Libliography of potential sources of competencies is included.

Dodl, Norman R., Director, The Florida Catalog of Teacher Competencies, Panhandle Area Educational Cooperative, Post Office Drawer 190, Chipley, Florida, 32428. (In state cost $7.50, out of state cost $10.00).

Teacher Education program descriptions from institutions throughout the country were used to generate basic statements of teacher competency. Additional input was taken from teachers, public school personnel, and university personnel.

Franke, Eleanor L., "Pupil Achievement and Teacher Behaviors: A Formative Evaluation of an Undergraduate Program in Teacher Preparation," Dissertation, University of Nebraska, 1971.

Eight teacher behaviors were identified and judged by three experts as being representative of the components of the NU STEP program.

Ganoe, Noreen S., Pace, Wilda, Shearer, Patsy, Weiss, Violet C., and Dr. Vernon Boushell (Director)

Brevard Teaching Center, 905 Pineda Street, Cocoa, Florida 32922

Competencies are classified as cognitive and affective, several of each being listed. Considerable attention is given to affective competencies.

Hollis, L. Y. and W. Robert Houston, Acquiring Competencies to Teach Mathematics in Elementary Schools, Professional Educators Publications, Inc. Lincoln, Nebraska.

Competencies are listed and specific means and examples of how the competencies can be achieved are stated.

Houston, W. Robert, Improving Mathematics Education for Elementary School Teachers, A Conference Report. Sponsored by the Science and Mathematics Teaching Center of Michigan State University and the National Science Foundation.

Thirty-seven objectives are ranked after having been evaluated as to importance for a prospective elementary teacher. The evaluation was done by conference members on a five point scale and the arithmetic mean of the evaluation was used to rank the competencies from highest to lowest rated.

Houston, W. Robert and Robert Underhill, University of Houston, Houston, Texas.

A list of competencies was developed, revised and then evaluated by educators throughout the country.

National Council of Teachers of Mathematics, Guidelines for the Preparation of Teachers of Mathematics, 1973.

These guidelines are stated in terms of specific competencies and are intended for use in improvement of teacher education programs.

Nebraska Secondary Teacher Education Program (NU STEP), University of Nebraska.

Parker, Reese, Weber State Program, Weber State College, Ogden, Utah.

Teacher Education Modules, Florida Center for Professional Development Materials, 506 Knott Building, Tallahassee, Florida 32304.

These materials, designed for pre- or in-service teacher education treat teaching skills or concepts deemed fundamental to teaching. Each module contains information and directions needed to achieve a set of observable goals. Evaluation of each module is in terms of either a product or a performance. When judgement is to be passed by a "qualified evaluator," the criteria to be used is stated.

Teacher Education Program, University of Washington Secondary, (STEP).

Appendix B
Learning Environment

Brevard Teaching Center, Vernon Boushell, Director, Brevard County Board of Education, Brevard County, Florida.

This center is patterned after the teacher centers of England In-service teachers are brought to the center with their students. At the center the expert or "lead" teachers work with both the pupils and teacher in developing better mathematics program for the elementary schools.

Florida Technological University Program, Michael C. Hynes, Florida Technological University, Box 25,000, Orlando, Florida 32816.

Houston University Program, Robert Houston, Houston University, Houston, Texas.

Kent State University Elementary Mathematics Program, James W. Heddens, Team Leader, Elementary Education, Kent State University, Kent, Ohio, 44240.

The Kent State Program continues lecture, discussion and laboratory methods of intruction through the use of the Kent State University School. This laboratory school (N-8) provides a setting in which prospective teachers may demonstrate their teaching skills.

University of South Florida Program, Gerald Weeks, University of South Florida, St. Petersburg Campus, St. Petersburg, Florida.

Weber State Program, Parker Reese, Director, Weber State College, Ogden, Utah.

Appendix C
Instructional Materials

Fitzgerald, W. M., Laboratory Manual for Elementary Teachers, Boston, Prindle, Weber, and Schmidt, 1973.

Florida B-2 Modules, Florida Department of Education; Part B, 2, USOE grant under the Education Professions Development Act.

Hollis, L. Y. and W. R. Houston, Acquiring Competencies to Teach Mathematics in Elementary Schools, Lincoln, Nebraska; Professional Educators Publications, Inc., 1973.

Hooten, J. R. and M. L. Mahaffey, Elementary Mathematics Laboratory Experiences, Columbus, Ohio; Charles Merrill, 1973.

Hynes, M. C., Brumbaugh, D. K. and M. L. Kysilka, A Source Book of Activities for Elementary Teachers: Mathematics, Austin, Texas, Texan House, Inc., 1973.

Moon, et.al., Basic Arithmetic: Audio Tapes, Columbus, Ohio: Charles Merrill.

National Council of Teachers of Mathematics, Topics in Mathematics for Elementary School Teachers, Washington, D.C.: N.C.T.M., 1964.

National Council of Teachers of Mathematics, More Topics in Mathematics for Elementary School Teachers, Washington, D.C.: N.C.T.M., 1969.

WILKIT's, Reese, Parker, Weber State College, Ogden, Utah.

Appendix D
Time Limitation Alternatives

Brevard Teaching Center, Vernon Boushell, Director, Brevard County Board of Education, Brevard County, Florida.

As an in-service training center, the Brevard System is exempt from the University's scheduling constraints.

Florida Technological University Program, Michael Hynes, Florida Technological University, Box 25,000, Orlando, Florida 32816.

Kent State University Program, James W. Heddens, Elementary Education, Kent State University, Kent, Ohio 44240

The Kent State mathematics methods course for elementary teachers has been released from the constraints of the quarter structure by the administration.

Appendix E

Brevard Teaching Center, Vernon Boushell, Director, Brevard County Board of Education, Brevard County, Florida, 1973.

The Brevard Center is utilizing video-taping and peer panels for evaluation purposes.

Flanders, N. A., "The Changing Base of Performance-Based Teaching," Phi Delta Kappan(55) 312-315.

Hollis, L. Y. and W. R. Houston, Acquiring Competencies to Teach Mathematics in Elementary Schools, Lincoln, Nebraska: Professional Educators Publications, Inc., 1973.

McDonald, F. J., "The National Commission on Performance-Based Education," Phi Delta Kappan(55) 296-298.

Merwin, Jack C., Performance-Based Teacher Education: Some Measurement and Decision-Making Considerations, Washington, D.C.; American Association of Colleges for Teacher Education, 1973.

Bibliography

Carroll, J. A., Handbook on Formative and Summative Evaluation of Student Learning by Bloom, B. S., Hastings, J. T., and F. Madaus, New York, McGraw-Hill, 1971.

Hynes, M, C., Brumbaugh, D. K., M. L. Kysilka, A Source Book of Activities for Elementary Teachers; Mathematics, Austin, Texas Texan House, Inc., 1973.

Morford, M. L.. A Taxonomy Approach to the Production of Achievement in Mathematics Education for Prospective Elementary Teachers, (Doctoral Dissertation, Kent State University) Ann Arbor, Mich., University Microfilms, 1970, 70-5964.

Phi Delta Kappan (55), January, 1974

This issue is devoted to a discussion of competency/performance based teacher education. Much attention is given to the decision of the Texas legislature to mandate C/PBTE for all state institutions of higher learning.